

Guidelines for the Preparation of Traffic Impact Analyses for Development Applications

Frederick County

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By the Board of County Commissioners,

Resolution No. 11-24



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Introduction/Administration

These Guidelines have been adopted by the Frederick County Board of County Commissioners (BOCC) for use, as applicable, by County staff, consultants, the Frederick County Planning Commission (FCPC), and the BOCC for certain zoning matters, to assess the traffic impact of development proposals for testing road adequacy under the Frederick County Adequate Public Facilities Ordinance (APFO) and other codes as applicable. The Guidelines also indicate the manner in which traffic and road information will be presented to the FCPC and the BOCC. The Guidelines serve both the purpose of supplying regulation as well as practice. Tasks and methodologies preceded by “shall” are considered as regulation and those preceded by “should” are considered as a practice or guideline.

While the need for and level of completeness of a traffic impact analysis (TIA) is determined by the Traffic Engineer, adequacy findings must be made for all developments as required by the APFO.

In addition to the other requirements of these Guidelines, all TIA’s should include the following:

1. Name of the development, applicant and civil engineer, and their contact information.
2. Application reference to the type of application it supports.
3. A plan of appropriate scale showing all proposed driveways and internal roadways and the acreage and proposed density of the subject parcel.
4. A vicinity map showing the exact location and boundaries of the parcel.
5. Any previous application numbers and approvals associated with the parcel.

A glossary of terms frequently used by transportation professionals is provided in Chapter 1 of these Guidelines. General information for initiating a TIA is provided in Chapters 2 through 4. Chapter 5 provides detailed guidance on TIA requirements for each type of application. Chapters 6 through 10 describe the specific procedures required for the TIA. Chapters 11 through 13 de-

scribe the procedures for Transportation Facilities Mitigation Plans.

These Guidelines assume certain levels of completeness and reliability of tools or resources that are referenced throughout this document. If or when these tools or resources are not at the level of reliability or completeness necessary for the accurate development of TIAs, the Traffic Engineer may require the use of alternative tools or resources, so long as they are consistent with professional engineering practices.

The portions of these Guidelines pertaining to the development of a TIA shall apply to any traffic engineer, regardless of whether or not they are contracted by the County or a developer.

CHAPTER 1 Glossary of Terms and Acronyms

Access Controls - Regulations by which access to a road facility from individual driveways, minor streets or major streets may be limited for the purpose of increasing roadway capacity and improving safety

Arterial - A roadway for through traffic linking major traffic generators and communities to regional highway facilities

At-Grade Intersection - The location at which two roadways cross and join at the same vertical elevation; access through the intersection may be controlled by traffic signals, roundabouts or stop/yield signs

Average Daily Traffic (ADT) - The total traffic volume passing a point or segment of a roadway in both directions during an average 24-hour period

Background Traffic - In a TIA, existing traffic in accordance with recent traffic counts + traffic generated by pipeline development + growth in through traffic on the current road network, all assigned to the existing and proposed roadway network

Capacity - On a roadway link, the maximum number of vehicles which can pass a given point during one hour under prevailing roadway and traffic conditions

Capital Improvement Projects (CIP) – County listing of programmed (budgeted) capital improvements by year of projected development

Collector - A roadway with no control of access linking residential or commercial communities with the arterial roadway system

Comprehensive Plan (CP) – Approved Countywide master plan including the official master plan of transportation; includes Corridor and Community Plans

Consolidated Transportation Program (CTP) - Maryland Department of Transportation (MDOT) listing of programmed (budgeted) capital improvements by year of projected development, primarily for State Highway Administration (SHA) roadways

Community Development Authority (CDA) – County authority set up to issue bonds for improvements to be repaid by the benefiting community.

Critical Lane Volume (CLV) - At an intersection, the sum of the critical movements in the north-south direction and the east-west direction

Critical Movement - At an intersection, the highest total of the through movement (and right turns when an adequate turn lane is not provided), plus its opposing left-turn movement in one direction on an hourly, per-lane basis

Cycle - The time period required for one complete sequence of traffic signal indications

De Minimus Development - A development which generates 5 or fewer peak hour trips during the peak hour of the adjacent street

Design Speed - The maximum safe speed for which the various features of the roadway are designed

Diverge Point - A location at which a single lane of traffic separates into two separate lanes, such as where a ramp leaves a highway

Existing Traffic - In a traffic analysis, current traffic in accordance with recent traffic counts on the current road network, “recent” being defined in Chapter 3

Expressway - A divided highway for through traffic with partial control of access (no driveways) mixing grade-separated interchanges and some well-spaced at-grade intersections

Freeway - A divided highway for through traffic with full control of access using grade-separated interchanges exclusively for access

Grade Separation - A location where roadways cross, with one passing over the other on an overpass, but lacking a direct connection via a system of ramps

Grade-Separated Interchange - A location where roadways cross, with one passing over the other on an overpass, with ramps joining the two roadways

Level of Service (LOS) - A qualitative measure using a sequence of letters from A through F to describe the quality of operational conditions within an intersection, roadway link or corridor.

Merge Point - A location where a ramp enters a highway, allowing traffic to enter the main traffic flow on the highway

Modal Split - The percentage of people using a particular means of transport, such as auto, transit, bicycle or walk, to make a trip

Operating Speed - The 85th percentile observed speed for given roadway and traffic conditions not affected by congestion or a traffic control device

Pass-By Trip - A trip generated by a land use which is already using the road adjacent to the site; frequently associated with non-destination land uses such as retail centers, service stations and fast-food restaurants

Peak Hour - The one-hour period of greatest utilization of a road, or other transportation facility; weekdays normally have two peaks, morning and afternoon

Peak Period - A three-hour period during which a road, or other transportation facility, has significantly increased use; includes the peak hour

Phase - A portion of a traffic signal cycle allocated to any traffic movement or combination of movements

Pipeline Development - Development having an approved or conditionally approved and valid preliminary plan of subdivision, site plan, Phase II plan or a recorded plat, but is not yet occupied

Ramp - A length of one way roadway providing an exclusive connection between two roadways

Roadway Link - A segment of roadway between two intersections

Study Area - Critical transportation facilities (defined as site access points; intersections; interchanges; roadway links and/or corridor) to which 25 percent, or 50 peak hour trips, of the site generated traffic is assigned, but not less than 13 trips.

Through Traffic - Trips which begin and end outside of a given study area passing through the study area
Total Traffic - In a TIA, background traffic plus traffic generated by development under consideration

Traffic Impact Analysis (TIA) – The assessment of site traffic impacts and mitigation alternatives based on traffic forecasts and analysis techniques described in these Guidelines

Traffic Control Device (TCD) - Any sign, signal, pavement marking or device placed or erected for the purpose of regulating, warning or directing traffic and/or pedestrians

Traffic Engineer - The staff person located in the Development Review Engineering (DRE) Department of the Division of Permitting and Development Review (DPDR), or such other staff persons who may be designated to advise Commissioners on traffic issues

Traffic Management Plan (TMP) – Operations and safety plan developed for major events expected to overburden facilities over short periods of time

Transportation Facility – Roadway, transit, bike lane, sidewalk, trail, traffic control device, etc.

Transportation Facilities Management Plan (TFMP) - Conceptual improvement plan used to seek concurrence of scope among agencies

Travel Demand Management (TDM) - Strategies to reduce vehicular commuting trips, including the use of carpools, vanpools, buses, bicycling, walking, compressed work hours, or working from home.

Trip Assignment - The process of allocating vehicle travel generated by a land use to/from each link of the roadway network

Trip Distribution - The process of estimating the direction of travel and the length of vehicle trips originating from or destined for the development

Trip Generation - The process of estimating the number of vehicle trips originating from or destined for the uses on a land parcel

Volume-to-Capacity Ratio (V/C) - A performance measure computed using the ratio of an actual roadway volume to the capacity of a roadway link

Weaving Section - A highway section where the pattern of traffic traveling in the same direction entering and leaving at adjacent points of access results in vehicle paths crossing each other

CHAPTER 2

Traffic Scope, Development & Process

An assessment of the area that will be affected by traffic generated by the proposed development must be made. The size and shape of the study area should depend on the size and type of development proposed, the development's trip making characteristics, the existing and planned roadway system, adjacent and proposed land uses, and the presence of natural or man-made barriers.

Prior to beginning a traffic study, the applicant or designee normally submits a Notice of Intent to Develop (NID) and request that Development Review Engineering (DRE) identify the study scope. The NID is on the next page. DRE will discuss with the applicant the scope of proposed study area and the other relevant assumptions associated with the proposed TIA.

The study area should include all significant and critical transportation facilities (defined as site access points; intersections between collectors, arterials, freeway ramps and/or expressways; roadway links that are functionally deficient or where signalized intersections are not the critical peak direction traffic constraint; and/or corridor systems) to which 25 percent, or 50 peak hour trips, of the applicant's site-generated traffic is assigned, whichever is less (represents a lower volume), but usually not less than 13 trips; or as otherwise determined by the applicant and Traffic Engineer.

The TIA may be prepared by the County consultant (generally within 2 to 4 weeks depending on complexity and traffic count requirements) or by a consultant contracted by the applicant and based on the Guidelines outlined in Chapters 3 through 10 of these Guidelines. Good communication between the applicant, Traffic Engineer and the consultant is paramount, especially for developer contracted work. Upon receipt of the completed TIA, it should be immediately logged and turned over to the Traffic Engineer who will endeavor to perform a review of the study for sufficiency within three days. This review consists of the following:

1. Verifying existing conditions and counts.
2. Checking consistency of all assumptions with the NID and other supporting documentation of the application, reviewing of pertinent assumptions with the applicant.
3. Confirming the appropriate use of procedures and methods of analysis from these Guidelines or from other professionally recognized sources.
4. Confirming the submission of all count sheets, surveys, project scoping or other site-specific field data.

Upon completion of this review, if the traffic study is deemed acceptable by the Traffic Engineer, it will be submitted electronically and 2 hard copies with disc (submitted with the plan submission), to the County for distribution to SHA, DPW and a municipality, if applicable, for review and comment. If it is not adequate, it will be immediately returned to the consultant for modification.

[Continued on page 8]

Frederick County
Division of Permitting and Development Review
Development Review Engineering

Notice of Intent to Develop (NID)

This form should be completed at least 6 weeks prior to submitting a development application requiring APFO – Roads approval.

1. Date:
2. Applicant/Applicant's Engineer and phone/e-mail:
3. Development Name:
4. Type of Application (Site or Preliminary Plan):
5. Location (attach map showing site location and boundaries) including address and/or Liber/Folio:
6. Existing Use (check one): Residential_____ Commercial_____ Other:
If Residential, number and type of units:
If Commercial, amount and type of space & site size:
If other, describe:
7. Proposed Use (check one): Residential_____ Commercial_____ Other:
If Residential, number and type of units proposed:
If Commercial, amount and type of space proposed & site size:
If other, describe:
8. Other assumptions, comments &/or attachments, if applicable:
9. DPDR to select Traffic Engineering (TE) firm _____
Or, preferred TE firm(s) (order of preference):

SIGNED: _____

Applicant or Applicant's Representative Date

Staff Use Only

- APFO Exempt (< 6 new trips during street peak hours)
- APFO Consideration (6 to 25 new trips during street peak hours)
- APFO Testing (> 25 new trips during street peak hours or > 50 during site peak)

County Traffic Engineer

Date

CHAPTER 3

Inventory

Roadway Configuration

As part of the TIA, an inventory of the study area should be performed, indicating the characteristics of existing roadways, shown on a map of appropriate scale. A field inspection of the roadways which will be affected by traffic generated by the proposed development should be made to determine the number of lanes, the number of approach lanes at intersections, the location of median openings, type of TCD's in place, and horizontal and vertical alignment (if irregular).

Traffic Counts

Recent traffic counts should be included for all links and intersections within the study area. Counts at intersections should normally consist of AM and PM weekday peak-hour turning movements and/or turning movements at other times as deemed necessary by the Traffic Engineer. The beginning and ending times for the peak hours will be identified by inspection of peak period or longer duration count tabulations. Traffic counts may be available from the State Highway Administration (SHA) or County DPW. Traffic data must reflect existing normal peak-hour conditions at the time of the study, and should not normally be used if the data is more than one year old at the time of original submission of the NID or if significant changes have occurred at or near the count location since the count was taken. The traffic consultant shall be responsible for providing traffic counts that are not available through the state or the County. Traffic counts assessing typical weekday AM and PM peak hours should not be conducted during periods when schools are closed, or on the day of and days before or after national or local holidays, or on Mondays or Fridays. While summer counts are discouraged, they may be used when approved by the Traffic Engineer with the application of an appropriate adjustment factor based on SHA's Traffic Trends Report.

A count should not be used if there are significant traffic incidents (crashes, closures, etc.) or inclement weather in the vicinity of the count

location during the count. In addition, ongoing construction on nearby roadways may cause temporary diversions that could result in counts which do not reflect normal conditions. Adjustments to counts taken under these circumstances should be made using a method acceptable to the Traffic Engineer.

Transit

Existing transit service that serves the proposed development should be noted. The location of bus routes, location of bus stops, frequency of service, and hours of operation should be noted. This information is necessary if vehicle trip reductions are being assumed.

Pedestrian and Bikeway Facilities

Facilities delineated in the County Bikeway and Trails Plan which connect or are proposed to connect the proposed development to nearby trip-generating uses should be noted. This information is required if vehicle trip reductions are being assumed because of these facilities as well as for defining site frontage and off-site needs. Data on the expected share and distribution of pedestrian and cyclist trips may be considered in the preparation of the traffic study by the Traffic Engineer.

Land Use

Knowledge of nearby existing land uses and their approved access locations is useful in assessing the access required from the roadways in the study area. Field inspection will determine existing land uses.

Traffic Crash Data

Information relating to traffic safety and efficiency, including access points, directional signing, internal circulation and general parking proposals may be assessed. The crash data to be presented should be obtained for the most recently available three-year period prior to the submission of the study. Crash rates (based on total and fatal crashes) for the subject roadway link should be compared to the average for roadways of comparable classification in Frederick County. Crash data and rates are obtained from the SHA and County.

CHAPTER 4

Projected Traffic Growth and Planned Transportation Improvements

For the TIA, the growth in traffic within a study area should include traffic generated by certain other approved development in the study area and an estimate of growth in through traffic.

Growth in through traffic may be estimated using either historical traffic data, knowledge of the surrounding area, or application of the County travel demand model. Extrapolation of historical data, normally from ten years previous based on actual counts, may be considered acceptable for developments that will be built within a five-year time horizon. More in-depth study of the surrounding area is encouraged for development proposals of a broader scale. For those study areas that are within 2 miles of the County line or a municipality, an effort should be made to identify those trips in the study area that have an origin or destination from land uses outside the County. Through traffic growth should normally only be shown on arterials, expressways and freeways.

The amount of approved development that should be considered in traffic studies for various types of development reviews (i.e. zoning, subdivisions, site plan, and special exceptions) will vary depending on the type of development review underway and the expected date of development opening and completion. The requirements for considering approved development for each type of study are identified in the appropriate paragraphs in Chapter 5. At this time, there is no single source of reference for approved, or background, development. Field checking of background development is required for all land uses in stages of physical development.

Planned transportation system improvements considered in preparing traffic studies will also vary depending on the type and phasing of the development under study. Planned improvements that should be considered are identified in Chapter 5. Improvements in the County's Capital Improvement Program (CIP) and the State's Consolidated Transportation Program (CTP)

which are fully funded for construction can be considered so long as they are projected to be open to traffic by the time the development opens. Improvements by others with full surety would have the same status as CIP or CTP improvements when the following criteria are met:

1. The surety is sufficient to fully cover the estimated construction cost of the improvement assumed in the traffic analysis.
2. The construction or right-of-way permit has been approved by the SHA or County, respectively.

CHAPTER 5

Requirements for Traffic Studies for Various Types of Applications

Any TIA should provide the necessary information to support the required findings for the proposed development. Those developments generating 50 or fewer trips during the identified peak hour(s) of the adjacent street are exempt from APFO but shall be required to contribute to existing escrow accounts, unless they are considered a de minimus development and therefore, will not be required to contribute to any existing escrow accounts.

The following discussions highlight more detailed information required for TIAs associated with the major types of development applications.

Floating Zones A summary of required procedures is described below for Non-Euclidean zones, Planned Unit Developments (PUD) and Mixed Use Developments (MXD), Phase I and II applications. Additional guidance can be provided by the Traffic Engineer.

(1) Phase I (Rezoning) Applications:

If deemed necessary by DOP, the traffic analysis for a Phase I application should support the requirements for approval. DOP Staff may prepare an evaluation of the transportation facilities on the Comprehensive Plan (CP) in conjunction with the full development of the area; taking into consideration any known changes that have tak-

en place in development since the master plans were approved.

The traffic analysis will be based on forecasts of average daily traffic (ADT) volumes developed utilizing the DOP travel demand forecasting model applied to roadway links. The specific requirements of a traffic analysis PUD/MXD Phase I applications is as provided for in the Frederick County Zoning Ordinance.

(2) Phase II Plans:

Approval of Phase II Plans requires that adequate transportation facilities consistent with the requirements of the APFO will be available to support the proposed development. See the following discussion for specific details for TIA development of subdivision/site plans as the requirements are the same.

Subdivision and Site Plans

The Frederick County Code (Chapter 1-20) requires that the Planning Commission determine that the roads that will serve a proposed development will be adequate. To make this finding, a TIA is typically required if the proposed development will produce more than 50 trips during the identified peak hour(s) of the adjacent street.

The study must forecast future traffic volumes for the roads and streets within a study area that has been approved by the Traffic Engineer. This would include pipeline and pending development, producing more than 5 trips per hour, which have APFO approval, as determined by the Traffic Engineer.

A listing of all properties considered in projecting future traffic volumes shall be provided by the Traffic Engineer and must be included in all TIAs submitted. Growth in through traffic should be projected using the methods outlined in Chapter 4.

Transportation improvements that may be used for traffic studies as part of the required test for adequacy must have 100 percent of the construction funds programmed in either the adopted County CIP or the current State CTP on or before the expected year of opening of the site, or if phased, the opening of the particular phase of

the site (per APFO Sec.1-20-31(B)(4)). Roadway improvements participated in or funded by the developer will also be considered, provided such improvements are imposed by the FCPC as a condition or conditions of approval. Improvements by others may have the same status as CIP or CTP improvements when the criteria in Chapter 4 are met.

When assessing any development with a noted or assumed site generated trip cap that is exceeded in any critical peak hour, an entirely new TIA (and APFO approval) must be developed using current day counts and assumptions. In the case of change of use of an approved development that is still within the identified trip cap, but whose new peak hour trip assignment is greater than 25 trips on any link, the original approved TIA's counts and other assumptions may be used, but with the new trip distribution and assignment based on the new land use. When assessing any vacant building, the highest level of trips that the previous use had generated shall be considered the base case and only those additional trips may be considered as new for the purpose of establishing study threshold and APFO mitigation requirements. If any mitigation is required it would be in conformance with Chapters 11-13 of these Guidelines.

CHAPTER 6

Trip Generation

The TIA must always include a breakdown of the development proposed, consistent with zoning and the site plan (when applicable), and consistent with the proposed uses shown and described in the NID. A complete summary of gross square footage by land use category should be provided for all nonresidential land uses. A summary of the number and type of dwelling units proposed should be provided for residential land uses. This information will facilitate the application of appropriate trip generation rates.

Appendix A provides trip generation rates for various land uses unique to Frederick County. These rates were developed by studies of existing land uses in Frederick County and should be used in all traffic studies when applicable. Trip generation rates for land uses not cited in these Guidelines should be estimated using the most recent edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual. Trip generation rates for any uses not cited in the Guidelines or the ITE manual should be researched for validity and are subject to approval by the Traffic Engineer. Should the trip generation data be collected, the trip generation report should include the following:

1. Specific time period for data collection (i.e. dates and times)
2. Specific location of measurement stations
3. Measurement techniques (visual, mechanical)
4. Specific description of the site(s) chosen (to include size of development, land uses, occupancy, number of employees at work on the day of data collection, and hours of operation, if relevant)
5. Description of pertinent site characteristics (e.g., number of employees, square footage, ownership, availability of transit and parking).

It is expected that normally AM and PM weekday peak hour rates and weekend mid-day peak hour rates, by direction, will be analyzed unless the Traffic Engineer has agreed otherwise. When using ITE rates, the formula is always preferred over the average rate unless there is some particular technical or statistical justification to propose otherwise, which will require approval by the Traffic Engineer.

The trip generation rate estimate developed should reflect the potential of the proposed land use(s) to produce or attract vehicular trips. The estimates developed in the traffic study are useful in determining access requirements. Analyzing the impact of the proposed land use(s) on the roadway network may necessitate considering other factors, such as diversion from the existing stream of traffic. For example, much of the traffic to and from a community shopping center may actually be newly generated trips; the remainder is intercepted from traffic already on the roadway, referred to as either diverted or pass-by trips. Diverted trips may be attracted from a nearby facility and are usually conservatively assumed to be new trips, especially in smaller study areas. However, pass-by trips should be calculated using the procedure in the latest edition of the ITE manual. For an office building, however, virtually all of the traffic is newly generated with few or no trips diverted from the traffic already on the highways.

Adjustments for internal “captured” trips may be applied for new land uses or additions to multi-use developments, consistent with ITE methodologies and with concurrence from the Traffic Engineer

For nonresidential development, trip generation will be based on the amount of each type of land use specified in the traffic study.

When recommending approval of the subject development, the Traffic Engineer will include a condition that caps the trips being generated by the development based on the TIA. Similar conditions or capping would also apply to multifamily or condominium residential development.

Any trip reduction strategy proposed at the outset of a study process should be identified in the NID and strategies outlined in the TIA as outlined in Chapters 10 and 11.

CHAPTER 7 **Trip Distribution**

Existing and projected traffic volumes entering and leaving the study area should be assigned to the roadway network by time of day. The existing traffic distribution, by principal direction of travel, may be used as a guide for determining the site trip distribution when the proposed development is of limited scope and major alteration of the roadway system is not planned. The most recently published US Census of Travel or MWCOG Regional Household Travel Survey can also be considered during the distribution of trips. Depending on the scale of the proposed development, planned roadway improvements, and existing traffic conditions, it may be desirable to use regional trip tables from the County travel demand model for the distribution of trips.

When using a different technique than described above, the distribution of trips associated with the proposed development should be justified by the relative location of other generators. For mixed-use developments, it will be necessary to distribute residential, shopping and employment trips separately based on surrounding residential, retail and commercial development.

CHAPTER 8 **Modal Split**

During this stage of the analysis, the use or potential use of transit service or trip reduction strategies may be addressed. Transit availability as determined in the inventory stage is used to assess the potential for future transit use.

It should be recognized that the trip generation rates presented in Appendix A were based on surveys of sites in Frederick County where public transit service may have been available. The same is true of sample sites in the ITE Trip Generation Manual. Any projected increases in transit ridership should be based on planned changes in the availability of service, cited references or actual data. It should further be realized that transit use varies for differing trip purposes (work trips, shopping trips, etc.) and

should be applied as a percentage reduction of total trips.

Assumptions regarding future travel to the site with the use of trip reduction strategies should be based on regional or local survey data, and the proximity of various other land uses, related to the trip reduction strategies to be implemented by the applicant. Local data may be collected and utilized if the collection method is agreed to by Traffic Engineer prior to conducting such surveys.

CHAPTER 9 **Trip Assignment**

After reducing generated trips by modal splits, if applicable, projected traffic volumes should be assigned to the roadway network within the study area using the distribution factors previously developed per Chapter 7. Should more than one parallel route option be available in the same travel shed, a further subdivision of trip distribution is encouraged resulting in reasonable assignments based on likely travel times, avoiding such situations as all or nothing assignments whenever possible.

CHAPTER 10 Network Evaluation

The ability of the roadway network to accommodate projected traffic volumes generated by the proposed development should be assessed utilizing various techniques to measure capacity of the transportation network facilities. Facility capacities are defined over a range of operating conditions utilizing the level-of-service (LOS) concept. A description of this concept is included in the *Highway Capacity Manual* (HCM). The techniques selected to measure capacity and determine corresponding levels of service depend on the nature of the study area and the facilities under study.

In areas where the flow of traffic is controlled by signals, spaced far enough apart that their operation do not conflict with one another (generally one mile or more), the critical lane volume (CLV) analysis, which is a broad evaluation of the capacity of an intersection that determines the LOS for a given set of demand volumes and geometrics, should be used. The advantage of the technique is that it is simple and easy to use. The technique to be utilized is to be found in the Guidelines for Traffic Impact Reports/Studies published on line by the SHA.

In those cases when signal phasing is known, it should be assumed that such phasing will continue to be used in the future. There are cases when the analysis indicates that an improved LOS could be achieved by changing the phasing of an existing signal or restriping the approach to an intersection. The approval of the appropriate operating agency must be obtained by the applicant before such a change will be considered in any staff recommendation.

Traffic volumes on the roadway links (segments) in the study area should generally be analyzed when the distance between traffic signals is two miles or greater or when deemed necessary by the Traffic Engineer, often in cases where the effect of grade or lane reductions can create a bottleneck type constraint. In such cases the procedures outlined in the Two and Multi-lane Highways chapters of the HCM, should be utilized. LOS for multilane uninterrupted flow locations will be measured by density and volume to capacity ratio (V/C) and conform to the values shown in the HCM.

When multiple signals spaced closely together (usually within ½ mile) and other factors combine in a cumulative effect on congestion, the independent analysis of links and intersections may underestimate the actual levels of congestion. In this case, such as in some sections of the US 40, MD 85 and MD 351 corridors, the analysis procedures outlined in the Urban Streets Chapters of the HCM, may need to be utilized.

When un-signalized intersections are deemed critical by the Traffic Engineer, the procedures recommended in the Stop Controlled chapters of the HCM for analyzing such intersections, may be employed. When average vehicle delay for a turning movement exceeds the adequacy threshold, additional studies, including queuing analysis, should be conducted to determine potential means to correct the deficiency. The type of study deemed appropriate would be determined by the Traffic Engineer. In some cases, elimination of a movement and diversion of the demand to a nearby location may be the preferred treatment. A review of the interaction of conflicting movements at adjacent access points may be required. For all critical intersections with State roadways, the CLV analysis should also be performed

If a traffic signal warrant study is deemed appropriate, the warrant study must be conducted in accordance with the requirements of SHA. When an intersection is proposed to be signalized in the traffic study, the intersection must be analyzed under the CLV procedure to ensure that further physical improvements to the intersection beyond the signalization are not needed to achieve adequacy. However, unacceptable delay during a peak hour at a site entrance is not usually a justification for the installation of a traffic signal. While the installation of a signal may be appropriate at some point, in which case an agreement to fund that signal shall be required, SHA or the County shall determine whether and when to install signals.

Where the site generated volume on a stop-controlled approach would be 30 vehicles per hour (vph) or less, any LOS problem that may exist is considered to be negligible and an adequacy finding and mitigation would not normally be required.

The current US version of the aaSIDRA evaluation model or the HCM should be used for the analysis of roundabouts.

In circumstances where a TIA identifies a deficiency within the study area, the applicant may choose to recommend an action that would mitigate the deficiency per the requirements established in the APFO (Section 1-20-31). Such actions can consist of physical improvements, which add capacity to the transportation system, or programmatic initiatives that would result in trip reduction.

Physical improvements, such as roadway widening, intersection geometric improvements, intersection movement diversions, or signalization improvements attributable to the applicant will be considered, provided responsibility for carrying out such actions is clearly identified. The design and construction of any recommended improvement must receive the concurrence of the appropriate state, county, municipal or other appropriate public agency. The design policies and standards of the agency shall apply to any applicants who propose to construct the improvements under permit to the agency. These standards may include provision of sidewalks, trails, and bike lanes adjacent to the roadway or intersection improvements (including agency defined ADA compliance) within the agency's right-of-way or easements.

Trip reduction programs should be tied to the staging of the proposed development so that their potential for success can be evaluated. Provision should be made for a trip monitoring techniques that can be validated by the Traffic Engineer. The program may include typical elements such as: employee transit incentives, parking management, car sharing and car pooling programs. The elements of the plan, trip reduction goals and monitoring periods would be determined through consultation between the developer, his traffic engineer and the County Traffic Engineer.

Along all County collector and arterial roadways, entrance and intersection sight distance (ISD) should meet American Association of State Highway and Transportation Officials (AASHTO) standards as outlined in Chapter 9 of the "Green Book" for new public streets and other new access points that generate more than five trips per hour. All new entrances, regardless of facility type and

number of trips being generated, shall meet the AASHTO "Green Book" Chapter 3 requirements for stopping sight distance (SSD).

The analysis may need to identify and evaluate off-site bicycle, pedestrian, and transit access, and roadway safety needs, as well as on-site circulation and operational needs.

For Phase I analysis and in all other cases when there are no existing escrow accounts, limited file information, and no signalized intersections, the County's travel demand model output and the LOS ADT lookup chart found in Appendix B could be used to make the requisite APFO findings and considerations. Other than for Phase I considerations, this "short form" would only be used at the discretion of the Traffic Engineer and if there is a clear finding of adequacy with no conditions of improvements.

For land uses limited to special events which will generate relatively large amounts of traffic, usually during non-traditional, non-weekday, peak periods for limited durations throughout the year, adequacy should be determined by review of a traffic management plan (TMP), in addition to other applicable analysis techniques discussed in the scoping meeting. The Traffic Engineer should consider the projected number of vehicle trips for each such special event compared to the safety and operational capabilities of the feeder roads to accommodate that traffic; the classification and character of the roads which will be utilized for access and egress to and from the event as it relates to the change in use of the roadways or intersections that the events may temporarily cause; and the number of days per year and hours per day the event will impact the local users of the road.

The Traffic Management Plan (TMP) should contain at least the following elements:

1. Routes through which the bulk of the traffic will be directed or otherwise find its way from the nearest major arterials to the project site, and the manner in which such traffic will be directed. On and off site traffic direction (point control) by law enforcement or other qualified personnel, shall be delineated if required by the traffic engineer.
2. Temporary traffic control solutions for infrequent special events (in the event the

site will have regular permanent uses, permanent improvements must be provided) such as spot intersection widening, signing, traffic control devices (e.g. temporary and adjusted signals) and ITS.

3. Operational analysis containing, but not limited to: projected queuing, intersection and corridor speeds and delay, and safety analysis.
4. A procedure for the event organizer to notify appropriate parties of the event in a specified timeframe prior to implementation of a special event or series of special events.
5. Provisions for emergency vehicle access to the site from arterial and higher classified roadways.

The plan must be provided to the DPDR for distribution to the Sheriff's office, DPW and other roadway agencies, such as SHA, for comment and be approved by the Planning Commission in conjunction with site plan approval. The special event TMP will be subject to review by the agencies annually or as otherwise determined by the Traffic Engineer.

CHAPTER 11

Mitigation Plans

Mitigation measures will be required when LOS results do not meet the APFO standards. The TIA should identify optimal methods of mitigating off-site deficiencies for present and proposed phases of the development. It should not necessarily limit the mitigation focus to the specific location identified where an unacceptable deterioration of the LOS standards has been identified. In some cases it may be preferable to direct site-generated traffic to other roadways. In other cases, improvements made apart from the identified deficient location may divert enough background traffic to create enough reserve capacity for the site generated traffic and thus mitigate the impacts. Build out year and development phasing may be considered in the mitigation section of the report.

Mitigation should be consistent with improvements identified in the transportation element of

the master plan and CP. At a minimum, the TIA should consider ultimate rights-of-way and additional streets, bicycle, transit, and pedestrian connections and extensions and intersection improvements that are identified in the CP. Mitigation measures may also include, but are not limited to, alternative or additional street connections and street extensions, turn lanes and turn lane extensions, intersection turning movement elimination, signalization, signal modifications, installation of medians, shared access and other access management strategies, geometric improvements such as lane geometry improvements, and intersection realignments, structure widening, frontage roads, local or collector roads, and alternative access.

Off-site bicycle and pedestrian facilities may be required when there is a reasonable attraction between the development and a nearby attraction, such as between a residential development and a school or train station. When deemed necessary and reasonably implementable, the improvement should not exceed a distance of 0.5 mile for sidewalks and 1 mile for bicycle and trail facilities. A fee-in-lieu of construction may be permitted by the Planning commission if costs are deemed excessive either from a cost per dwelling unit basis or a larger than normal cost element, such as a bridge, is required to accomplish the project; or if right-of-way cannot be acquired.

Where stop-controlled intersections do not meet the minimum performance standard, an additional street connection or a street extension to distribute traffic from the site to another access point, preferably on a different road, should be considered as a potential mitigation measure, especially when installation of a signal can be avoided.

Mitigation measures must be evaluated with regard to their operational, safety and effectiveness before being recommended. A measure that provides additional capacity but creates an operational or potential safety problem is not acceptable. Mitigation measures that involve changes in the number or usage of lanes at an intersection or the phasing at a signalized inter-

section will require conceptual approval from SHA or Frederick County Division of Public Works (DPW).

The mitigation section of the TIS may include a travel demand management plan in accordance with these Guidelines. The trip reduction anticipated in an approved travel demand management plan should reduce the site trips, thereby also reducing site traffic impacts and associated financial obligations. All monitoring would be the responsibility of the developer with review and approval by the Traffic Engineer.

Any construction, whether it be performed by the applicant, another developer or a road club, must be permitted for construction prior to the issuance of specified building permits (for site plans) or recordation of specified plats (for subdivisions) for the subject development. Construction needs to proceed on a timetable so as to assure that the improvement will be open to traffic prior to the issuance of any Certificates of Occupancy (COO), which may be withheld until the improvement is open to traffic.

The Transportation Facilities Mitigation Plan (TFMP) is a conceptual set of improvements jointly identified by the applicant and Traffic Engineer to delineate the conditionally approved improvements by the FCPC. Every reasonable effort must be made to minimize a piecemeal approach to mitigation and one that is not consistent with County and State long range plans. The TFMP defines what needs to be done and when it needs to be accomplished but is generally silent on how it is to be built and by whom (except when a road club or fee in lieu of construction is proposed). The TFMP would be circulated for review and comment to SHA and DPW for acceptance, and to a municipality or city if the improvements are contained in or within one mile of that municipality/city. These concepts must be approved by the implementing agencies prior to development of Improvement Plans. All conditioned improvements shall be noted on final plats and site plans.

In the case of improvements of Interstate interchange ramp intersections with cross streets, Interstate Access Point Approval (IAPA) or

lesser reviews may be necessary, and if so required, needs to commence at least a year prior to submission of a County Improvement Plan (IP) or SHA permit plans so as to minimize any delays that may be forthcoming associated with added State and Federal reviews and approvals.

CHAPTER 12

Escrow Accounts for Pro-Rata Contributions and Surplus Capacity Reimbursement

Road improvement escrow accounts are established every time a developer qualifies to provide a fair share pro-rata contribution toward a future improvement or construct an improvement. Once established, the escrow account shall remain open and active until the necessary funds are fully contributed to either fund the improvement or reimburse the party responsible for its construction.

The APFO permits the Planning Commission to allow an applicant to pay a fair share pro-rata cost, determined by the Traffic Engineer, of the improvements necessary to alleviate any inadequacy per APFO Sec. 1-20-12(C). These payments may not be phased and shall be made prior to the initial building permit issuance (for site plans) or first recorded plat (for subdivision). Any improvement would need to be consistent with the approved master plan or other County or State plans, and acceptable to the implementing agency.

The calculation of the pro-rata share contribution, whether it is for future or previously built improvements, is based on the proportion of the development's impact to the capacity created by the improvement. For instance, if a site adds 10 CLV's to an intersection's LOS and the identified improvement required to achieve adequacy improves the intersection by 200 CLV's, the pro-rata share of the improvement cost would be 5% or 0.05 times the cost in total fee. Where capacity cannot be easily defined, such as with a signal improvement, the pro-rata share is a proportion of the developer's impact to the impact from future development at CLV=1450. As in the case of the previous example, the share would be 10 CLV's divided by the difference

between 1450 and existing CLV's. In the case where the existing CLV exceeds 1450, 1600 would be used as the number from which the existing CLV's are subtracted.

The development of a cost estimate on which to apply the pro-rata share contribution is necessary in order to determine the actual cash payment required. This is performed by the engineer for the applicant first requiring the establishment of the escrow account. The estimate must be performed using the best available information and generate quantities necessary to provide a reasonable level of accuracy and shall include all anticipated hard and soft costs associated with the improvement. The more the detail, the lower the contingency factor; the less the detail the higher the contingency factor, that would be added to the net cost estimate. In general, SHA project planning stage I cost per mile estimates would be acceptable for links and stage II quantity costs would be acceptable for intersections. The engineering cost associated with the development of the estimate may be credited to the first developer's pro-rata share payment.

The cost basis of the improvement, whether actual or estimated, will be inflated annually by the Traffic Engineer based on an appropriate published construction cost index

The APFO allows for a developer or government agency that creates surplus capacity on the roadway network to be partially or fully reimbursed by other developers under certain circumstances. This section of the Guidelines establishes the criteria that County staff would use to identify potential Surplus Capacity Reimbursement (SCR) improvements.

Only transportation improvements necessary to satisfy adequate public facilities requirements are eligible for SCR. Access-related or frontage-related improvements required by SHA or, the County are not eligible for reimbursement.

If a transportation improvement meets the above criteria, the applicant would normally provide the following information and data for review by

the Traffic Engineer for the possible establishment of an SCR:

1. Engineering and construction plans for the transportation improvement sufficient to provide detailed cost estimates for completion, including right-of-way acquisition, utility relocation, design, inspection and construction management costs.
2. An executed agreement or permit with the County DPW, SHA or municipality, certifying total estimated cost.

Once an SCR improvement is established (or any escrow account), all future non-exempt developments generating more than 5 trips would normally be required to pay their fair share toward the improvement, whether the account be inside or outside the project's study area. Reimbursement to developers for constructed road improvements, up to but not beyond their identified financial responsibility, would first be via existing escrow funds, second building excise tax credits (BET), if permitted by ordinance, and finally future escrow account contributions. Any BET credits used to compensate the developer for the excess capacity created, would be repaid by a future escrow account.

Once the Traffic Engineer determines that the surplus capacity associated with an SCR improvement has been fully utilized, the escrow account shall be closed. A fully utilized account is one that is equal to the total actual (not inflated) approved cost, minus the constructing developer's pro-rata fair share contribution to the improvement. Additional participation in an SCR improvement by subsequent parties will not be allowed. Instead, a finding of adequate public facilities will be required for these future development proposals; roadway improvements above and beyond the SCR improvement may be made a condition of that finding.

Escrow accounts may be established for mitigation of safety, geometric, pedestrian and bike enhancements, if the costs of such improvements are deemed excessive by the planning commission.

APPENDIX A

Frederick County Trip Generation Rates

[To be developed by the County traffic engineering consultants under direction of the Traffic Engineer]

Active Adult Single Family Detached

Active Adult Single Family Attached

Senior Housing

Other

TABLE 4 - 1
GENERALIZED ANNUAL AVERAGE DAILY VOLUMES FOR FLORIDA'S
URBANIZED AREAS*

UNINTERRUPTED FLOW HIGHWAYS					
Lanes Divided	Level of Service				
	A	B	C	D	E
2 Undivided	2,000	7,000	13,800	19,600	27,000
4 Divided	20,400	33,000	47,800	61,800	70,200
6 Divided	30,500	49,500	71,600	92,700	105,400

STATE TWO-WAY ARTERIALS					
Class I (>0.00 to 1.99 signalized intersections per mile)					
Lanes Divided	Level of Service				
	A	B	C	D	E
2 Undivided	**	4,200	13,800	16,400	16,900
4 Divided	**	4,800	29,300	34,700	35,700
6 Divided	**	7,300	44,700	52,100	53,500
8 Divided	**	9,400	58,000	66,100	67,800

Class II (2.00 to 4.50 signalized intersections per mile)					
Lanes Divided	Level of Service				
	A	B	C	D	E
2 Undivided	**	1,900	11,200	15,400	16,300
4 Divided	**	4,100	26,000	32,700	34,500
6 Divided	**	6,500	40,300	49,200	51,800
8 Divided	**	8,500	53,300	63,800	67,000

Class III (more than 4.5 signalized intersections per mile and not within primary city central business district of an urbanized area over 750,000)					
Lanes Divided	Level of Service				
	A	B	C	D	E
2 Undivided	**	**	5,300	12,600	15,500
4 Divided	**	**	12,400	28,900	32,800
6 Divided	**	**	19,500	44,700	49,300
8 Divided	**	**	25,800	58,700	63,800

Class IV (more than 4.5 signalized intersections per mile and within primary city central business district of an urbanized area over 750,000)					
Lanes Divided	Level of Service				
	A	B	C	D	E
2 Undivided	**	**	5,200	13,700	15,000
4 Divided	**	**	12,300	30,300	31,700
6 Divided	**	**	19,100	45,800	47,600
8 Divided	**	**	25,900	59,900	62,200

NON-STATE ROADWAYS					
Major City/County Roadways					
Lanes Divided	Level of Service				
	A	B	C	D	E
2 Undivided	**	**	9,100	14,600	15,600
4 Divided	**	**	21,400	31,100	32,900
6 Divided	**	**	33,400	46,800	49,300

Other Signalized Roadways (signalized intersection analysis)					
Lanes Divided	Level of Service				
	A	B	C	D	E
2 Undivided	**	**	4,800	10,000	12,600
4 Divided	**	**	11,100	21,700	25,200

Source: Florida Department of Transportation Systems Planning Office
605 Surrancee Street, MS 19
Tallahassee, FL 32399-0450
<http://www11.fwy.florida.com/planning/systems/spl/los/default.htm>

FREEWAYS					
Interchange spacing ≥ 2 mi. apart					
Lanes	Level of Service				
	A	B	C	D	E
4	23,800	39,600	55,200	67,100	74,600
6	36,900	61,100	85,300	103,600	115,300
8	49,900	82,700	115,300	140,200	156,000
10	63,000	104,200	145,500	176,900	196,400
12	75,900	125,800	175,500	213,500	237,100

Interchange spacing < 2 mi. apart					
Lanes	Level of Service				
	A	B	C	D	E
4	22,000	36,000	52,000	67,200	76,500
6	34,800	56,500	81,700	105,800	120,200
8	47,500	77,000	111,400	144,300	163,900
10	60,200	97,500	141,200	182,600	207,600
12	72,900	118,100	170,900	221,100	251,200

BICYCLE MODE
(Note: Level of service for the bicycle mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of bicyclists using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/ Bicycle Lane Coverage	Level of Service				
	A	B	C	D	E
0-49%	**	**	3,200	13,800	>13,800
50-84%	**	**	2,500	4,100	***
85-100%	3,100	7,200	>7,200	***	***

PEDESTRIAN MODE
(Note: Level of service for the pedestrian mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of pedestrians using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	Level of Service				
	A	B	C	D	E
0-49%	**	**	**	6,400	13,500
50-84%	**	**	**	9,900	19,000
85-100%	**	2,200	11,300	>11,300	***

BUS MODE (Scheduled Fixed Route)
(Buses per hour)
(Note: Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.)

Sidewalk Coverage	Level of Service				
	A	B	C	D	E
0-84%	**	>5	≥4	≥3	≥2
85-100%	>6	>4	≥3	≥2	≥1

ARTERIAL/NON-STATE ROADWAY ADJUSTMENTS			
DIVIDED/UNDIVIDED			
(after corresponding volume by the indicated percent)			
Lanes	Median	Left Turns Lanes	Adjustment Factors
2	Divided	Yes	+5%
2	Undivided	No	-20%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

ONE-WAY FACILITIES
Decrease corresponding two-directional volumes in this table by 40% to obtain the equivalent one directional volume for one-way facilities.

*This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Values shown are two-way annual average daily volumes (based on K₁₂ factors) for levels of service and are for the automobile/truck modes unless specifically stated. Level of service letter grade thresholds are probably not comparable across modes and, therefore, cross-modal comparisons should be made with caution. Furthermore, combining levels of service of different modes into an overall roadway level of service is not recommended. The table's input value defaults and level of service criteria appear on the following page. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, Pedestrian LOS Model and Transit Capacity and Quality of Service Manual, respectively for the automobile/truck, bicycle, pedestrian and bus modes.
 **Cannot be achieved using table input value defaults.
 ***Not applicable for that level of service letter grade. For automobile/truck modes, volumes greater than level of service D become F because intersection capacities have been reached. For bicycle and pedestrian modes, the level of service letter grade (including F) is not achievable, because there is no maximum vehicle volume threshold using table input value defaults.